**UNIT 3 - AOS 1 MIND, BRAIN AND BODY**

**DOT POINT #4**

* **Methods used to study the level of alertness in normal waking consciousness and the stages of sleep:**

- Measurement of physiological responses including electroencephalograph (EEG), electrooculargraph (EOG), heart rate, body temperature and galvanic skin response (GSR)

- The use of sleep laboratories, video monitoring and self reports

**Learning Intentions:**

1. To understand why a number of research methods are used to study consciousness
2. The advantages and limitations of using physiological measurements to study consciousness
3. To understand how the following physiological measurements are used in research and how each measurement differs between being alert, drowsy and in various stages of sleep

The self-report method of measuring states of consciousness is a useful subjective measure; however, individuals may be dishonest, be unable to describe their experiences in words, or forget, intentionally or unintentionally, to provide crucial information to the researcher.

Behavioural observations, including the use of video monitoring, are useful in demonstrating some of the effects of altered states, but these are limited as they tell the researcher very little about what is actually happening inside the body.

Measurable changes in physiological responses are the most objective (free from bias) and reliable means of indicating different states of consciousness. The data is consistent and stable and it can be recorded and interpreted consistently between researchers and from time to time.

**There are limitations to using just physiological responses:**

1. Physiological responses may be observed and provide some information about a person’s state of consciousness, however, they are limited in describing the personal and private conscious experience. The only way to find this out is to ask a person to describe it.
2. Changes in physiological events may be due to other reasons and not a change in state of consciousness. For example, if a person is sick with a fever while asleep, this will alter their physiological responses and may be interpreted as a different stage of sleep.

**Three main devices used to study States of Consciousness**

1. **Electroencephalograph (EEG)**
2. **Electrooculargraph (EOG)**
3. **Electromyograph (EMG)**

**ELECTROENCEPHALOGRAPH (EEG)**

The **electroencephalograph (EEG)** is a device that detects, amplifies and records electrical activity in the brain in the form of **brainwaves.** It does this by monitoring the electrical activity of the brain that is detectable on the outside of the skull. Many tiny electrodes are placed on the skull in a symmetrical pattern.

Brainwave patterns may vary in **frequency** (ie: the *number* ofbrainwaves per second)

Brainwave patterns may vary in **amplitude** (ie: the *height* of peaks and troughs of the curved graph that represents brainwave activity)

**Four main types of brainwave activity and their association with consciousness**

|  |  |  |
| --- | --- | --- |
| **Brainwave pattern** | **Description** | **Association** |
| Beta waves | High frequency (fast) and low amplitude (small) |  |
| Alpha waves |  | The typical brainwave pattern when awake but very relaxed, such as in a meditative state, very drowsy or when we’re about to fall asleep.  Eyes are often closed.  May be seen in people with a coma |
| Theta waves |  |  |
| Delta waves | A steady pattern of low frequency (slow) and high amplitude (large) |  |

**Other brainwave patterns:**

|  |  |  |
| --- | --- | --- |
| **Brainwave pattern** | **Description** | **Association** |
| K-complexes  Sleep spindles | Sharp rise and fall in amplitude lasting for about two seconds)  Periodic bursts of rapid frequency | Both are characteristic of stage 2 NREM sleep |
| Sawtooth waves | Random, fast waves that are slightly bigger than alpha waves | They resemble awake waves but occur during REM and associated with dreaming |

**Summary:**

* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (EEG) is a device that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and records electrical activity in the brain in the form of brainwaves.
* Beta waves are the distinctive brainwave pattern that occurs when we are awake and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ waves have a medium frequency and a mixed amplitude.
* When we are lying in bed, feeling drowsy but still awake, we are likely to exhibit \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ brainwaves.
* K-complexes consist of a sharp rise and fall in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and sleep spindles are periodical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrical activity.
* Sawtooth waves are associated with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sleep.
* The four major patterns of brainwave activity are called:

1.

2.

3.

4.

**ELECTROOCULARGRAPH (EOG)**

The **electrooculargraph (EOG)** is a device that detects, amplifies and records electrical activity in the muscles that allow the eye to move. The resulting signal is called the electrooculargram. It measures the change in voltage as the eyes move and rotate in their sockets.

**What can the EOG tell us?**

**ELECTROMYOGRAPH (EMG)**

The **electromyograph (EMG)** is a device that detects, amplifies and records electrical activity in the muscles. The resulting signal is called the electromyogram. An EMG indicates changes in electrical activity in muscles that accompany changes in states of consciousness.

**What can the EMG tell us?**

**OTHER PHYSIOLOCIAL MEASUREMENTS:**

* 1. **Heart Rate**
  2. **Body Temperature**
  3. **Galvanic Skin Response**

**HEART RATE**

Heart rate may be measured using a standard heart rate monitor or by using a device known as an **electrocardiograph** (EKG) that detects, amplifies and records the electrical activity of the heart muscles. Heart rate is measured in beats per minute (bpm).

**What can the EKG tell us?**

**BODY TEMPERATURE**

Body temperature follows a circadian rhythm; it varies in a regular way over a 24 hour period. It is usually measured by recording the temperature on the skin of the fingers.

Our body temperature tends to peak in the mid-afternoon and reach its lowest point in the early hours of the morning.

Body temperature is linked to alertness and may explain way some cultures encourage mid afternoon siestas and why most accidents occur in the early hours of the morning.

**A graph of body temperature over a 24 hour period:**

**Body temperature in other states of consciousness.**

* **Alcohol-induced state**
* **Ecstacy**

Body temperature is not regulated during REM sleep causing it to drift towards the temperature of the surrounding environment.

**GALVANIC SKIN RESPONSE (GSR)**

The physiological response that indicates the electrical conductivity of the skin is known as the **galvanic skin response (GSR).** As the skin becomes more moist (through perspiration), its conductivity increases.

During normal waking consciousness, events that cause us to perspire such as strong emotional responses or physical activity will increase our GSR. Conversely GSR decreases when we are relaxed and not in a hot environment.

**Limitations of physiological measurements?**

**1.**

**2.**

**OTHER METHODS TO STUDY STATES OF CONSCIOUSNESS:**

1. **The use of Sleep labs**
2. **Video Monitoring**
3. **Self-reports**

**THE USE OF SLEEP LABORATORIES**

A **sleep laboratory** is a place used for scientific research on sleep. It usually resembles a bedroom. The participant stays one or more nights.

**What does the sleep technician monitor?**

**What challenges do sleep labs present for researchers?**

**Limitations of sleep labs?**

**VIDEO MONITORING**

**Video monitoring** is now a common method that can be used both is sleep laboratories and in the participant’s own home. It uses infrared cameras that operate silently to allow footage to be seen and taped in the dark without disturbing the sleeping participant. The recordings can be observed at any time after the period of sleep and given to multiple researchers to interpret. Recordings can also be shown to participants to help them become aware of and understand their behaviour, for example, showing what they do when they sleep walk or even observing the effects of a snoring partner on their sleep.

If done at home, video monitoring allows the participant to sleep in their **natural environment.**

**Limitations of video monitoring?**

**SELF-REPORTS**

**What was the quality of your sleep last night?** You have just completed a self-report.

Self-reports are statements and answers to questions made by participants concerning their thoughts and feelings.

They can be carried out in the following ways:

* Questionnaires
* Diary entries
* Interviews

Self-reports can indicate whether a person is experiencing normal waking consciousness.

For example, asking a person in an ASC to tell a story about something that happened yesterday is likely to generate a response that is missing pieces or does not make complete sense.

**Limitations of self-reports?**

**TEST YOUR UNDERSTANDING**